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PROBLEMS IN LEAD MINING APPRAISALS (PART II)

THE previous issue of this Appraisal Bulletin discussed some of the initial problems that confronted us in the appraisal of lead mining properties. It also discussed one of the methods of arriving at a total gross annual income.

This bulletin will discuss and analyze the expenses involved in the mining-milling operation and the means used to process the net income into present value. We would like to reiterate that the economic approach is the prime factor in mine valuation. This approach, also called the income approach, is of prime importance because if a mining-milling operation cannot produce its product at a profit and there is little likelihood of its ever doing so, its value as a mine is nil.

The efficiency of mining and milling operations varies considerably, particularly from mine to mine. The efficiency is generally measured as percentage realization. The complexity of the realization factors can be demonstrated as follows: The geologists, in prospecting, discover an ore body, let us say, 4 feet in thickness and of 6% lead content. This would be known as 3% ore based on an 8-foot reserve base and would be carried on the reserves of this firm as 3% ore. The mining section, because of the height of the equipment, must mine at least 9- and generally 10-foot heights. Consequently, in order to mine this 4-foot thickness of ore, they must mine not only the additional 4 feet of poor rock that is carried in the reserves and has already been diluted from 6 to 3% by the addition of 100% poor rock, but the ore mined includes another 2 feet of poor rock. This reduces the grade of ore from the reserve base of 3% to 2.4%. This would be the assay as the ore reaches the mill. If we assume that the mill can extract 95% of the lead within the ore that is delivered to the mill, the content would be reduced to a little less than 2.3%. That 2.3% of the ore that is lead after milling contained what is known as lead concentrates which vary in lead content from mill to mill, not only depending on the efficiency of the mill, but also on the chemical composition of the ore being treated.

A thorough analysis of these recovery figures is not necessarily required to estimate the gross income expectancy based upon the method given in the last Appraisal Bulletin. Nevertheless, an analysis of these factors is necessary in estimating the future life of a mining operation. Later in this issue we will discuss the part these factors play in estimating the economic life of the subject properties.

The accounting department of the lead company cooperated fully and per-

mitted us to examine detailed breakdowns of its expenses over a period of years. Discussions were held with the head of the lead company's accounting department concerning wide variations in various items of production costs and concerning accounting problems for income tax purposes. The results of these conferences proved enlightening. First of all, it was realized that the lead company, the only one operating in the county, was a low-cost producer of lead concentrates. All other lead companies in the county had abandoned or sold their holdings to our client years ago for various reasons. For the most part, the other mining firms had practiced high grading - the practice of making the maximum profit without regard to long-term continuous operation - and, consequently, had mined all of the known rich reserves that they had, leaving only lower grade ores which could not be mined at a profit at that time. The operators of the remaining firm, on the other hand, followed very sound mining principles. In the first place, they added low-grade ore that could not be mined profitably by itself to higher-grade ore in order to be able to exploit most of their ore at a profit. Furthermore, they started an analytical study of all exploratory drillings that had been conducted in the past and consolidated this into an organized geological picture.

Based on this picture, they conducted an organized exploratory program instead of following a "by guess or by golly" method that had been used frequently in the past when ore bodies were more plentiful. This practice increased the number of pay holes drilled and gave them a better understanding of the overall geological picture. It should be pointed out that lead in this area is found in pockets similar to the holes in Swiss cheese, with some of the deposits large and some small. For the most part, the larger deposits had been discovered and mined in the past. This left the smaller deposits which are much more difficult to find and naturally more expensive to exploit. Lead is not found in layers like coal, iron ore, and limestone, generally at a known depth, a known thickness, and of consistent quality. This makes the analysis of the ore reserves extremely difficult. In the past, ore reserves were computed on the basis that a pocket had an average diameter of 100 feet; however, large pockets are few and far between since the area has been explored and mined for over 200 years. Today, when an ore body is discovered, the reserves are set up on the basis of a 60-foot diameter. Diamond core drilling is an extremely costly operation. For that reason, during very profitable years, a considerable amount of prospecting is done. In the leaner years, prospecting both by surface and underground drilling, is restricted. During the past several years, when prices were down, the explorations were reduced to a point that new discovery of commercial ore reserves did not equal the amount of commercial reserves mined. On this basis, a mine could not continue operations long. It was for this reason that exploration costs varied widely.

Another item of cost that varied widely and for the same reasons, was development costs. They include the expense of getting to the known ore reserves by blasting and digging out development drifts. These are passageways in limestone large enough for ore trains to operate and join the worked-out stopes with the new ore bodies. For the reasons listed in the preceding paragraphs, the lead company, in good times, blasted and dug these development drifts

which could be charged as an expense during the good year and would make a distant ore body available during some leaner years, perhaps when the price of lead would not warrant the digging of development drifts.

It was noted that in 1957 and 1958 development and prospecting costs were but a small percentage of the costs during the previous 8-year period. Inquiries and analyses revealed that, during the period of higher lead prices prior to 1958, the profits of the firm were very substantial. The firm, during these good years, found it possible to do extensive prospecting and developing to an extent that would not be possible during lean years. By prospecting we mean the process of finding new ore deposits by the use of diamond core drilling as well as by use of jack-hammers, both from the surface as well as from underground in drifts and stopes. By development we mean tunneling through rock to get ore bodies that are at a distance from existing drifts or stopes. A considerable amount of prospecting and development is not possible in lean years when the price of lead is low because the cost of doing that work can sometimes exceed the value of the ore bodies discovered and/or made available.

In 1958 lead prices were low and development and prospecting costs were reduced to a bare minimum - far below the amount that would be required to continue mining operations in this area for the potential economic life. Consequently, we believe that the costs on these two items should not be taken on the basis of 1958 averages but instead should be based on the average of the past 5 years, which would include good years as well as bad.

For the most part, labor, power, fuel, and powder costs are major items of expense and all have increased with the inflationary trend during the past decade and, therefore, an average of the past 5 or 10 years would not reflect accurately the increases that had taken place in those items during the interim. Consequently, it would be best to consider average costs for 1958 for these items as being more realistic for the future than averages of the past.

Analytical studies were also made of the other items of the expenses of the mining-milling operations, and it was decided that current 1958 costs were more realistic for the future than the lower costs of the recent past. One item included in cost, however, appeared excessive - real estate taxes. Recent overall increases applied throughout the State as a result of action by the State Tax Commission on the basis of assessment ratio studies caused real estate assessments to increase substantially. In the periods of high prices, the company did not object to paying high taxes. Over the years the lead company had practically subsidized the encompassed communities by its sizable tax payments. Prior to the State Tax Commission's order that counties must maintain assessment levels equivalent to at least 30 percent of fair market value, the only means of appealing an assessment if the owners felt that they were overassessed was on the basis of nonuniform assessments. One of the characteristics of mines is uniqueness, as no two mines are the same - qualitatively or quantitatively. The basis of comparing values of mines is practically impossible to determine. Consequently, an appeal prior to the ratio study was impossible. When the utilities and railroads within the State conducted assessment ratio studies based upon current sales prices a basis of assessment was estab-

lished. This study pointed out that many counties were assessing at less than 10 percent of true value or fair market value while other counties were assessing many times higher. As a result, the State Tax Commission ordered assessors to increase their assessments so that they would be a minimum of 30 percent of fair market value throughout the State. That order gave the taxpayers a basis for appeal. The lead company realized, after several increases and after the reduction in the price of lead, that its properties were worth considerably less than 3-1/3 times the current assessment. This was one of the reasons that the company called on us for a valuation of its vast holdings in this particular county. Consequently, in order to arrive at a fair estimate of future expenses, adjustments were necessary to make the real estate and personal property taxes more realistic, knowing that the lead company would continue to appeal its assessments until they became realistic and in line with other properties within the county and State. If the appraisal had been made entirely for the purpose of appealing the assessment, the existing taxes would have been used as an expense and adjustments made to the net income expectancy which would show the variations in value dependent on the assessment. The problem of adjusting anticipated taxes was based not only on reduction in the assessment but would entail adjustments in the tax rates. Based on the 1958 assessments, the company and its affiliates paid 34.2 percent of the property taxes in the county. With a major drop in the assessment, it was only reasonable to expect that the recipients of the tax, including the school districts, would require an overall higher rate in order to guarantee future revenues necessary to meet their local responsibilities. Consequently, the anticipated increased rates were applied against the adjusted anticipated assessment based on 30 percent of the estimated true value of the property.

To avoid repetition each item of expense was analyzed carefully and weighed with justification given, which would account for any deviations from the average of the past 5 years. The result was a fair estimate of the anticipated operating expenses to be expected during the remaining economic life of the property.

Once realistic anticipated income and expense figures were estimated, it was simply a matter of subtraction to arrive at a net before depreciation, amortization, etc. This net income stream in a mining operation was imputable to the return on and of the investment in the real as well as the personal property. The big question was, how long can the mining operation last?

It was explained earlier in this report that the ore was found in pockets with most of the larger and perhaps richer ones discovered and mined previously. Because of the great cost of prospecting through the use of diamond core drills, haphazard prospecting is not feasible economically. The policy of the lead company has been to attempt to add as much ore to its known reserves as it depletes by mining each year. In the recent past, because of the relatively low price of lead, the depletion of the known ore reserves has gone on more rapidly than new discoveries. On this basis there would be approximately only 5 years of known ore bodies.

There are three separate mining operations in this company's holdings in the county. The oldest has been explored thoroughly to the point that scientific

explorations do not reveal a sufficient number of pay holes to continue explorations. The cost of explorations exceeds the net value of the deposits discovered. Consequently, in the first instance the known ore reserves times its realization factor*, divided by the annual tonnage of reserves mined each year would equal the remaining economic life of that property. In the second instance exploration has been thorough, but there are still a few new discoveries that are made that prove a longer potential economic life. In the third instance, diamond drilling has resulted in a relatively high percentage of pay holes with continued expectation of successful prospecting.

On the basis of the past experience of this firm in the area and after consultation with their geologists, it was our conclusion that the remaining life of the overall mining operation would be 25 years. Since the life of the first operation could be fairly closely estimated and that for No. 3 reasonably estimated, we deemed it reasonable to ascribe a life to the No. 2 operation of an average of mines 1 and 3.

After the anticipated income and expense statements had been prepared and the economic life estimated, the next step was the estimation of the proper capitalization rate to be applied. Consideration was given to the rate of return earned and declared by the shares in the subject corporation as well as in other mining ventures. This was further complicated by the fact that the risk money as represented by the shares of common stock was earning, on an overall, less than nonrisk bonds. This had been brought about, generally, by the fact that the investing public has been attempting to hedge against inflation with little regard to the earning power of the individual share of stock. The rate of return expected by mining corporations generally averaged between 6 and 10%. It was impossible to estimate the rate of return due the real estate only, in this instance. Furthermore, from the income approach it would be highly speculative to divide the income between the returns expected on real and personal property. The value had to include the value of the entire operations with anticipation later of dividing more accurately that valuation between the component parts of real and personal property.

It should be pointed out that the capitalization rates on big enterprises such as this are considerably lower than the capitalization rates generally used on the average real estate market. Money may be borrowed by these large reputable corporations at rates considerably less than the average mortgage interest rates paid by real estate investors. Their debentures almost approach the minimum rates enjoyed by U. S. Government bonds and debentures.

In applying individual income approaches to the three mining operations under appraisement, consideration was given to the physical, functional, and economic factors. For instance, in the case of the operation that had the lowest percentage lead content in its reserves, which already is a marginal mine and could become a nonprofitable operation in any drop in the price of lead, we tended toward a higher capitalization rate, while for the mining operation that had the highest grade ore reserve and potential we used a lower capitalization

*Realization factor: tons of ore mined ÷ reduction in ore reserves by mining.

rate, bearing in mind constantly the fact that this was a rate to be applied against the net income of the enterprise.

The income approach was used on the overall operation as well as on the individual operations. The former approach resulted in a higher valuation than the sum of the three latter approaches because of the efficiencies of a larger operation. However, the individual approaches were used as a check as well as a guide for applying obsolescence to the individual mining units. Furthermore, the overall operation was higher because it included several sources of income that could not equitably be credited to any one of the three individual operations.

After the selection of the capitalization rate and estimating the economic life, the next question was, "How should the income be processed?" Because of the fact that this income was attributable to land including mineral rights, improvements and personal property, and the fact that fair market value could not be attributed exactly to any one of these elements of value, we concluded that a property residual approach would be better than either a land residual or a building residual approach. Furthermore, the income stream was speculative and did not have the characteristics of an annuity; therefore, the annuity premise could not be used. Because of the fact that land in the form of mineral reserves was also being depleted as well as the fact that the real improvements and personal property were also depreciating, it was concluded that the Hoskold formula should be the method applied in arriving at the present value of the future income stream. This formula results in present value of a series of annual payments of one dollar, after discounting for loss of interest on each dollar to the time of its collection. It is premised upon the assumption that each dollar of payment is composed of interest, and a partial return on capital which is invested in a compound interest sinking fund from which the original investment is returned in a lump sum.

In addition to the value of the anticipated income stream there were two other values that had to be considered in evaluating the operation. First, there was the reversionary value of the surface rights situated over the mineralized area that is owned by the company. Without doubt, the surface rights would still have a value when the ore reserves were depleted. In the second instance, there was the salvage value of the buildings and machinery and equipment (personal property) that would be available when the operation stopped. In the instance of the short-lived mining operations, we estimated that the salvage value would approximate 20% of the present-day physical value (before the application of obsolescence). In the longer lived operation we estimated that the salvage value would be but 10% of its present-day physical value. The reason for the differences in these salvage values is the fact that when the first mining operation closed there would still be two other operations that could use some of the machinery and equipment, including the mill equipment, while the last mine that closed would have relatively no market or use for the improvements or equipment that remained.

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